THE EFFECT OF NON-GENETIC FACTORS ON REPRODUCTIVE PERFORMANCE IN THE LARGE WHITE SOWS

Kramarenko Olexander
Ph.D. (Agraricultural Sciense), Senior Lecturer
Mykolayiv National Agrarian University

An analysis of the condition of animal husbandry in Ukraine in 1990-2015 showed that in order to overcome the crisis in the coming years, the total number of pigs must be increased from 6.7 to 22.0 million head, which will provide not only the competitiveness of the pig breeding industry, but also satisfy the demand of the population of Ukraine. During 2011-2019, the number of nursing sows of the Large White and Landrace breeds decreased 2-3 times [1]. Currently, these two breeds together make up 85% of the commercial pig population [2].

In current commercial pig breeding programs, great emphasis is placed on improving reproductive traits in sows. In general the breeding goal is to increase the number of piglets weaned per sow per year [3]. The improvement of litter size or sow productivity, however, is something of an enigma, as it is often difficult to identify and quantify the actual causes of variation [4].

According to [5], sows are capable of raising an average of 30-40 piglets annually, hence the need to study the reproductive performance of sows under different environments. Litter size at birth and at weaning and average weight of piglets at birth and at weaning are among the primary parameters used to measure the reproductive performance of sows. These important reproductive traits could be influenced by season, parity, breed and nutrition [6]. Whereas the last two factors can be controlled, year/season farrowing and parity could be difficult to control because they directly affect the volume of production. It is therefore important to perform a detailed analysis on how these could impact performance [7].

Seasonal and climatic influence on pig production had been reported in a number of studies in different countries. According to [8] year farrowing effect was significant for the litter size, but parity and season farrowing effects were significant only for litter size at birth, which increased up to the fifth parity and then declined steadily in subsequent parities. In addition it had been noted that the effects of the season or of the farrowing month are controversial, in particular because of the variation in the housing condition of the animals [9].

Thus, this study examines certain identifiable non-genetic sources of variation (parity number, year and season farrowing) for their effects on Large White sow litter performance traits, such as litter size, mortality and weight of piglets at birth and at weaning.

The population used for the present study is from a pig farm managed by Tavriys'ki svyni, LLC, located in Skadovsky district (Kherson Oblast, Ukraine). Reproductive performance records on 280 Large White (LW) sows were used. A total of 633 litters were farrowed from January 2007 to July 2017.

The litter records included information on the total number of piglets born (TNB), number of piglets born alive (NBA), number of stillborn piglets (NSB), frequency of stillborn piglets (FSB), average weight of piglets at birth (AWPB), litter size at weaning (NW), piglet pre-weaning mortality (PWM) and average weight of piglets at weaning (AWPW). To determine the effect of parity number, year and month farrowing on reproductive performance traits, the analysis of variance (ANOVA) was used.

Results obtained showed significant ($P < 0.05$) influence of parity number on most of the reproductive parameters studied, apart from AWPB, PWM and AWPW. The total litter size at birth was the lowest in primiparous sows and in cases second-parity sows, but significantly exceeded the overall average population estimation during the fourth-sixth parities farrowing. However, the number of piglets born alive in younger parity sows (i.e., at 1st-2nd parity) did not significantly exceed the overall population estimation. The least squares estimates of the mortality rate of piglets at birth (i.e., the NSB and FSB) were significantly lower in second parity sows, however they significantly increased in sows at 8th parity. Although the effect of parity number on piglet pre-weaning mortality was non-significant, in the LW sows studied the least squares estimates of litter size at weaning were significantly higher in sows at 3th-4th parities, but significantly lower in sows at 8th parity. In primiparous sows, the average weight of piglets at weaning was almost 1 kg less than in older parity sows.

Obtained results showed significant ($P < 0.05$) influence of the farrowing year on most of the reproductive parameters studied, apart from PWM. The least squares estimates of the total litter size at birth were significantly higher than the overall average population in sows farrowing in 2007, but in sows farrowing in 2013 and 2016, these estimates ranged from -0.996 to -1.033 piglets per litter. In 2010 and 2012, the mortality rate of piglets at birth was the highest for the entire study period, resulting in a significant decrease in the least squares estimates of the number of piglets born alive. At the same time, the lowest estimates of this trait were noted in sows farrowing in 2013, and the highest in sows farrowing during in 2007-2008. The low least squares estimates of the litter size at weaning in 2010 and 2013 can be explained, on one hand, by an increase of the piglet pre-weaning mortality, and on the other hand, associated with the lowest estimates by the number of piglets born alive per litter in 2013. The year of the sow's farrowing had the most significant influence on the weight of piglets at birth and at weaning. Moreover, a clear upward trend can be noted in relation to the weight of piglets at birth, which is accompanied by a gradual increase of the corresponding least squares estimates during 2007 through 2015. As for the weight of piglets at weaning, the negative significant least squares estimates were noted in sows farrowing during 2008 through 2011, and the positive significant estimates were recorded in sows farrowing during 2013, 2014 and 2016. On the other hand, sows that were farrowing in 2007 were characterized by heavier piglets at weaning, which exceeded the overall average by 1.678 kg. Finally, we found that the effects of farrowing month on most of the litter performance traits was non-significant ($P > 0.05$), apart from PWM and AWPW. The least squares estimate of the number of piglets at weaning, which was significantly lower than the overall average estimate, was noted in sows farrowing in September. Thus, late summer and early autumn (August-

October) are the seasons when the litter size traits in the LW sows consistently show the lowest values, indicating a 'seasonal infertility period' [10].

On the other hand, sows with farrowing in August were characterized by lower piglet pre-weaning mortality. Sows farrowing in June and August were characterized by heavier piglets at weaning, which exceeded the overall population average by 1.666 and 1.351 kg, respectively. Whereas sows farrowing in February had lighter piglets in the litter at weaning.

Thus, all the analysis performed in the present work shows that in the LW sows, as in other pig breeds, the parity number, year and season farrowing influence the reproductive and developmental processes.

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